

Do exercise attitudes cause exercise behavior?

A genetic perspective

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Social cognitive models of health behavior propose that individual differences in leisure time exercise behavior are influenced by the attitudes towards exercise, including the major perceived benefits of and barriers to exercising. However, genetic factors influencing personality, the acute mood effects of exercise, or exercise ability may affect both exercise behavior and the perception of its benefits and barriers.

This twin study tested whether exercise attitudes are heritable. Secondly, the genetic and environmental cross-trait correlations were estimated. If either is non-significant, this falsifies the hypothesis that the association between exercise attitudes and exercise behavior is causal.

METHODS

Survey data on leisure time exercise behavior (weekly METhours) and perceived benefits of and barriers to exercising were obtained from 3,906 twins and 1,189 siblings (18-50 years) that are registered with the Netherlands Twin Register. The **heritability of the exercise attitudes** was estimated by analyzing the resemblance between monozygotic (MZ) and dizygotic (DZ) twins and their siblings as a function of their genetic relatedness. De Moor's **non-experimental falsification of a causal hypothesis using genetic and environmental correlations** was applied (De Moor et al., 2008). If the perceived benefits/ barriers cause differences in exercise behavior, all genetic and environmental factors influencing individual differences in the perception of these benefits/ barriers would also, through the causal chain, influence individual differences in exercise behavior. A failure to do so falsifies the causal hypothesis.

Table 1 Correlation with exercise behavior (95% CI):

Attitude component	Phenotypic correlation
Perceived benefits	.32 (.29; .35)
Lack of skills/support/resources	♂ -.36 (-.39; -.31)
	♀ -.40 (-.43; -.37)
Time constraints	♂ -.37 (-.41; -.33)
	♀ -.28 (-.31; -.25)
Lack of energy	-.34 (-.37; -.32)
Lack of enjoyment	-.44 (-.47; -.42)
Embarrassment	-.20 (-.23; -.18)

RESULTS

Six main attitude components emerged from commonly used items by means of a Principal Component Analysis. They were all correlated with exercise behavior (Table 1).

Bivariate modeling further showed that all the genetic ($.36 < |r_A| < .80$) and all but two unique environmental ($.00 < |r_E| < .27$) correlations between exercise attitudes and exercise behavior were significantly different from zero (the exception were the attitude components 'Benefits' and 'Embarrassment' for males), which is a necessary condition for the existence of a causal effect driving the association.

Table 2 Heritability (95% CI) of exercise attitudes:

Attitude component	Heritability males	Heritability females
Perceived benefits	.21 (.11;.31)	.27 (.20;.33)
Lack of skills/support/resources	.45 (.35;.54)	.48 (.42;.54)
Time constraints	.25 (.15;.35)	.30 (.23;.36)
Lack of energy	.34 (.23;.44)	.44 (.38;.49)
Lack of enjoyment	.47 (.36;.56)	.44 (.38;.50)
Embarrassment	.42 (.31;.52)	.49 (.42;.54)
Exercise behavior	.50 (.41;.58)	.43 (.37;.49)



CONCLUSION

It is concluded that exercise attitudes and exercise behavior are heritable, that attitudes and behavior are partly correlated through pleiotropic genetic effects, but that the data are also compatible with a causal effect of exercise attitudes on behavior.

De Moor et al. (2008). Testing causality in the association between regular exercise and symptoms of anxiety and depression. *Archives of General Psychiatry*, 65(8), 897-905.